
Editorial...

PROFESSOR MARTIN H: son HOLMDAHL

Professor Martin H: son Holmdahl is the great man who introduced the concept of “Apnoeic Diffusion Oxygenation”¹ into clinical anesthesia.

During his visit to the American University of Beirut, I was indeed lucky when Professor Holmdahl MH invited me to his Department of Anaesthesiology, University Uppsala, Sweden. I was also, doubly honored and surprised when the internationally famous Professor asked me not to call him Professor Holmdahl, “call me Martin and I call you Anis”. His invitation to me to spend the first week of my visit with his family in the wonderful summer resort by the lake, was surely an over whelming hospitality.

I was impressed not only by the “Fatherly” attitude of Professor Holmdahl, an attitude which I tried to adopt during my Chairmanship at the American University of Beirut, but also by his highly academic, clinical and administrative competences, qualities deeply appreciated by the University which lead to his nomination as the Dean of the School of Medicine, and subsequently as President of Uppsala University.

When the tragic events started in Lebanon 1975, the Scandinavian countries including Sweden, Denmark and Norway were very sympathetic with our situation, and I was invited to lecture about our tragic events in Lebanon. The media in Uppsala wrote with sympathy about the Egyptian doctor who did not leave Lebanon during the events (Fig. 1, 2).

Professor Holmdahl in 1956, investigated “The Pulmonary Uptake of Oxygen, acid-base metabolism, and circulation during prolonged apnoea” which was published in a supplement in *Acta Chirurgica Scandinavica*, and he introduced us to the concept of “Apnoea Diffusion Oxygenation” (ADO)¹.

ADO can be achieved by preoxygenation with 100% oxygenation in order to denitrogenate the functional residual capacity (FRC) of the lung, followed by oxygen insufflation during the subsequent apnea. As explained by Holmdahl, during apnea, oxygen is extracted from the FRC into the blood at a rate of about 250 ml.min⁻¹ to maintain metabolic oxygen consumption. However, due to the high solubility of carbon dioxide in the blood, it is only added to the alveolar space at a rate of about 10 ml.min⁻¹, resulting in a net gas flow from the alveoli to the blood of about 240 ml.min⁻¹. Hence, a subatmospheric pressure is created in the alveoli, and the ambient oxygen is drawn “en masse” into the lung to maintain oxygenation during apnea¹.

Holmdahl recommended the technique of ADO for oxygenation during bronchoscopy which allowed the endoscopist to work uninterruptedly without the need to ventilate the patient. Although ADO can maintain oxygenation during apnoea, carbon dioxide accommodation at a rate about 3 mmHg.min⁻¹, limits the accepted duration of apnoeic bronchoscopy and permissive hypercarbia to about 6 minutes.

Fig. 1

Dean Martin Holmdahl of Uppsala and Dean Emanuel Papper of Miami listening to Dr. Baraka lecturing in Uppsala about the tragic events in Lebanon.



Fig. 2

Uppsala Press News writing about the Egyptian Doctor who did not leave Lebanon during the tragic years.

Fifty years later, Anis Baraka, together with his colleagues at the American University of Beirut, utilized the technique of ADO to delay oxyhemoglobin desaturation during induction of anesthesia in the morbidly obese patients².



The rapid hemoglobin desaturation during apnoea in the morbidly obese patient can be attributed to the increased oxygen consumption, and to the decreased FRC which reduces oxygen reserve. Whereas the FRC of normal patients decreases by about 20% following induction of anesthesia, in the morbidly obese patients it decreases by about 50% causing microdilatation resulting in ventilation/perfusion mismatch with a subsequent increase of the alveolar-arterial oxygen gradient which increases the intrapulmonary shunt from 2-5% in the non-obese up to 10-20% in the morbidly obese.

Our study showed that in morbidly obese patients, preoxygenation alone is followed by rapid oxyhemoglobin desaturation during the subsequent apnoea, with a significant negative correlation between the time to oxyhemoglobin desaturation at the body mass index. However, with the ADO technique of Holmdahl, when nasopharyngeal oxygen insufflation following preoxygenation was used, the onset of oxyhemoglobin desaturation during the subsequent apnoea was significantly delayed² (Fig. 3).

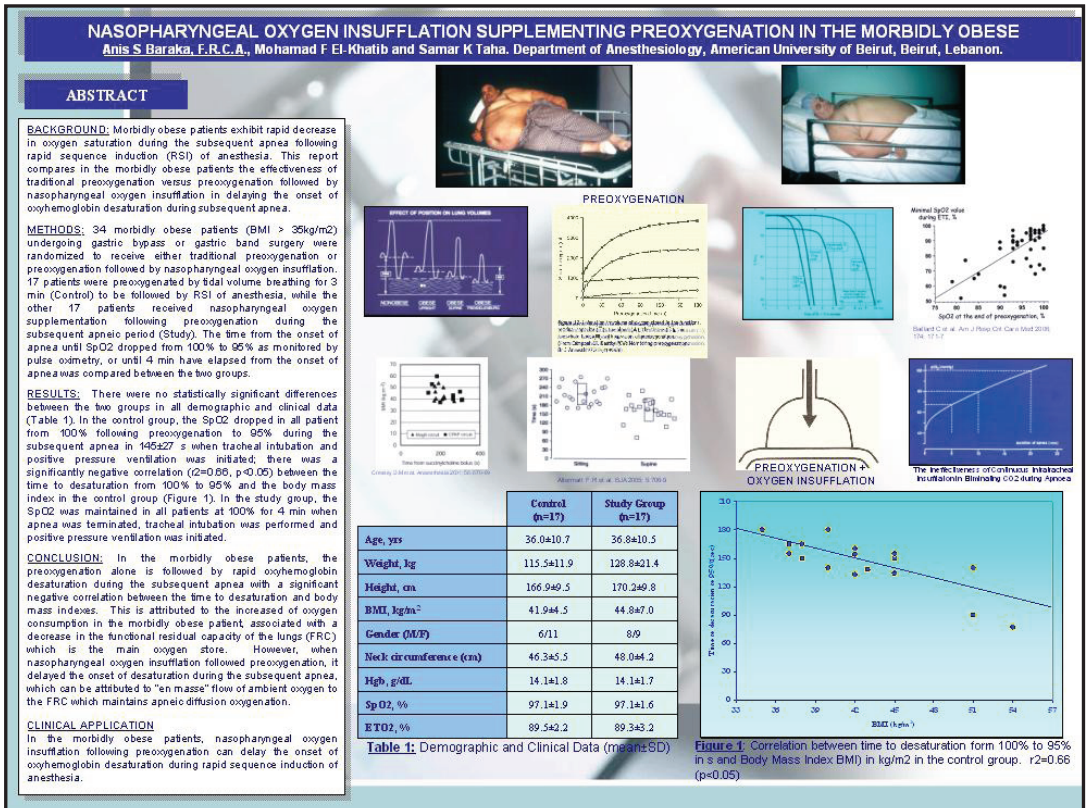
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Fig. 3



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